

REMARKS

The present amendment is in response to the latest Office Action, in which claims 1 through 20 were rejected over the prior art. Applicants have thoroughly reviews the outstanding Office Action including the Examiner's remarks and the reference cited therein. The following remarks are believed to be fully responsive to the Office Action and be believed to render all claims at issue patentably distinguishable over the cited references. Applicants most respectfully submit that all of the claims now present in the application are in full compliance with 35 USC 112 and are clearly patentable over the references of record.

Applicants have reviewed the specification which has been amended to correct any confusion between the meaning of "depth" and "thickness" as would be appreciated by one of ordinary skill in the art to which the invention pertains. Accordingly, all of the amendments are formal amendments or are supported by the original specification/drawings. Hence, no new matter is added or new issue is raised. The amendment to the specification serves to clarify the invention and does not introduce new matter into the application as would be appreciated by one of ordinary skill in the art to which the invention pertains.

In addition, claim 1 has been amended to add the limitation from claim 2 and claims 2, 12, and 19 have been canceled from the application without prejudice or disclaimer. Dependent claims 20 and 21 have been added to the application to further specific aspects of the invention as full described in the specification and especially the drawings. The claims now remaining in the application are claims 1, 3-11, 13-18 and 20-21 which are in full compliance with 35 USC 1112 and are clearly patentable over the references of record.

CLAIM REJECTIONS – 35 U.S.C. SECTION 102(b)

Claims 1, 5, 7-8 and 10-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Donley (U.S. Patent No. 4,299,862).

Applicants most respectfully traverse this rejection in view of the amendment to

the claims adding the limitation of claim 2, which is not included in the rejection to rejected claim 1 thereby obviating this rejection.

By at least referring to the following part of Donley: col. 2 lines 64-67, col. 3 lines 25-26, col. 4 lines 41-44, col. 4 lines 61-63, col. 5 lines 64-67, Figure 3, and Fig. 13, the Examiner is of the opinion that Donley discloses the scopes of these rejected Claims.

Initially, by carefully comparing this present invention with Donley, Applicants find that Donley is significantly different than the present invention. In this regard, the Examiner's attention is most respectfully directed to the original drawings and the following parts of the specification: page 3 line 23 to page 4 line 17, and page 6 line 14 to page 7 line 26 of the present application. Moreover, please also at least refer to the following parts of Donley: Fig.8 to Fig. 13, col. 1 lines 42-48, col. 1 lines 60-68, col. 2 lines 25-43, col. 4 line 21 to col. 5 lines 29, and col. 5 line 62 to col. 6 line 45.

The present invention is related to the problem of how to form a hole with a smooth opening. The present invention achieves its results by forming an over coating layer over a coating layer before a hole is formed inside both the coating layer and the over coating layer, where the etching rate of the over coating layer is higher than the etching rate of the coating layer. The mechanism is the higher etch rate induces a larger etched amount of the over coating layer than the etched amount of the coating layer induced by the lower etch rate. Thus, because the removed amount is proportional to the etch time, both the vertical direction and the horizontal direction, a hole with smooth opening, usually is outwardly oblique, is formed.

In contrast, Donley is related to how to prevent damage(s) induced by the undesired lateral etching process. Donley achieves his results by firstly forming a blanket layer, such as silicon nitride layer, on a substrate, also on any structure on the substrate, and forming an opening in the blanket layer and by sequentially forming a glass layer, with a larger etch rate than the blanket layer, on the blanket layer and forming a window inside both the glass layer and the blanket layer. The mechanism is different etch rates among different directions induce different etched amount. Thus, because an opening is formed before the formation of the glass layer, during the formation of the window, the vertical etch rate is larger than the horizontal etch rate, and then the undesired lateral etching process is effectively prevented.

Significantly, Donley uses the opening in the blanket layer to let the etching process for forming the window is asymmetric, to let the vertical etching process is not affected by the blanket layer and to let the lateral etching process is blocked by the blanked layer. Therefore, the formation of the opening is essential and indisputable for Donley.

However, because the present invention does not relate to how to prevent lateral etching process, it is not necessary for the present invention to form the opening in the coating layer, which corresponds to the blanket layer of Donley, before the over coating layer, which corresponds to the glass layer of Donley, is formed. Moreover, because Donley's method requires two etching processes, the efficiency of the present invention is degraded while Donley's opening is used. In particularly, because Donley's object is related to prevent lateral etching process but the present invention requires lateral etching process to for the required smooth opening of the contact window, it is not natural and reasonable to one of ordinary skill in the art to arrive at the presently claimed invention. Accordingly, it is most respectfully requested that this rejection be withdrawn.

CLAIM REJECTIONS – 35 U.S.C. SECTION 103(a)

The rejection of claims 2-4, 6, 9 and 12 under 35 U.S.C. 103(a) as being unpatentable over Donley has been carefully considered but is most respectfully traversed as is the rejection of claims 3-20 under 35 U.S.C. 103(a) as being unpatentable over Donley in view of Obeng (U.S. Patent No. 5,836,805).

Applicants wish to direct the Examiner's attention to the basic requirements of a prima facie case of obviousness as set forth in the MPEP § 2143. This section states that to establish a prima facie case of obviousness, three basic criteria first must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Section 2143.03 states that all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Applicant respectfully traverses this rejection.

By referring to col. 4 lines 51-53 of Donley and using the Examiner's position, the Examiner is of the opinion that the differences between Donley and Claims 2-4, 6, 9 and 12 are obvious to one of ordinary skill in the art to which the invention pertains.

By referring to col. 5 lines 11-31 and using the Examiner's position, the Examiner is of the opinion that the differences between Donley and Claims 13-20 are obvious in further view of the teachings of Obeng. However, there is no discussion in the Official Action of where in the reference is the necessary motivation to modify the teachings of the primary reference to arrive at the claimed invention, absent applicants' teaching. In re Fritch, 23 USPQ 1780, 1784 (Fed Cir. 1992) ("It is impermissible to engage in hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps.")

Initially, because claim 1 is patentable as discussed above, Applicants most respectfully submit that each of claims dependent 2-4, 6, 9, and 12 is patentable.

In this regard, Applicants wish to emphasize that the relations of etching rates claimed in claims 2-4 and 6 are not obvious, although the adjustments of the etching rate sometime only is routine job, there is no motivation and "obvious to try" is not the standard of obviousness under 35 USC 103. Otherwise, uses two layers with different etching rate to form a contact window with a smooth, even outwardly oblige, opening should have been a well-known skill and can be found in many published papers. Accordingly, it is most respectfully requested that this rejection be withdrawn.

In view of the above comments and further amendments to the specification and

claims, favorable reconsideration and allowance of all of the claims now present in the application are most respectfully requested.

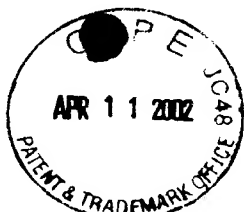
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IN THE SPECIFICATION:

On page 2, please replace the paragraph beginning at line 4 with the following amended paragraph.

No matter how, although width of contact window is decreased as integration is increased, [depth] thickness of contact window is still restricted in a finite range for heights of related semiconductor elements still are not negligible. For example, typical [depth] thickness of contact window of logic IC is about 1 micron. Nevertheless, for memory IC there are both gate and capacitor and then typical [depth] thickness of contact window is about 2 micron to 2.5 micron. Thus, aspect ratio is increased as scale of semiconductor element is minimized and then step coverage of filled material is degraded.

On page 2, please replace the paragraph beginning at line 26 with the following amended paragraph.

A direct solution to reduce aspect is increasing width of contact width, especially while height of contact window is restricted by heights of semiconductor structures. By the way, because outline of contact window is a main factor that affects how material is filled in the contact window, another conventional contact window is shown in FIG. 1B, where coating layer 12 is formed on surface of wafer 10 and contact window is formed by anisotropic etching. Obviously, step coverage of material 14 is improved and there is no overhang or void if sidewall of contact window is enough lean. No matter how, allowable width of contact window is strongly limited by the increased integration. Because each contact must be isolated with other contacts or semiconductor elements, there is a lowest limitation of distance between each contact and other contacts or semiconductor element. Obviously, width of contact window is limited by specific critical

dimension, and then aspect still is increased as [depth] thickness of contact window is increased.

On page 4, please replace the paragraph beginning at line 3 with the following amended paragraph.

First embodiment is a method for forming contact window. Provided method comprise following steps: First, form some semiconductor structures on surface of wafer and then form a coating layer surface of wafer, where [depth] thickness of coating layer is equal to or higher than height of semiconductor structures. Next, form an over coating layer over coating layer, where etching rate of over coating layer is higher than etching rate of coating layer. Then, form a contact window in both over coating layer and coating layer, where upper part of contact window is outwardly widened.

On page 5, please replace the paragraph beginning at line 6 with the following amended paragraph.

First of all, form a dielectric layer over surface of wafer, where surface of wafer comprises comprise gate, electrode of capacitor, isolation layer, multilevel interconnects, and other semiconductor structures. Moreover, [depth] thickness of dielectric layer is not less than heights of these semiconductor structures. Then, planarize the surface of dielectric layer by chemical mechanical polishing.

On page 8, please replace the paragraph beginning at line 4 with the following amended paragraph.

First of all, form a dielectric layer over surface of wafer, where surface of wafer comprises comprise gate, electrode of capacitor, isolation layer, multilevel interconnects, and other semiconductor structures. Moreover, [depth] thickness of dielectric layer is not less than heights of these semiconductor structures. Then, planarize the surface of dielectric layer by chemical mechanical polishing.

IN THE CLAIMS:

Please replace claim 1 with the following amended claim 1.

1.(Amended) A method for forming a contact window, said method comprise:
forming a plurality of semiconductor structures on a wafer;
forming a coating layer over [said] the surface of said wafer, where the [depth]
thickness of said coating layer is not less than the heights of said semiconductor
structures;
forming [a] an over coating layer over said coating layer, wherein the etching rate
of said over coating layer is higher than the etching rate of said coating layer; and
forming said contact window in both said over coating layer and said coating layer,
wherein upper part of said contact window is outwardly widened.